NATURAL HISTORY MISCELLANY.

BOTANY.

On the Fertilization of Grasses. — In gently flowing rivers of tropical America grow many fine aquatic grasses, species of Luziola, Oryza, Leersia, etc. The following note is from my journal under date of December, 1849, when threading in my canoe among the islands of the Trombetas: — "This channel was lined on both sides by a beautiful grass — a species of Luziola — growing in deep water, and standing out of it two or three feet. The large male flowers, of the most delicate pink, streaked with deep purple, and with six long yellow stamens hanging out of them, were disposed in a lax terminal panicle; while the slender green female flowers grew on the bristle-like branches of much smaller panicles springing from the inflated sheaths of the leaves that clothed the stem. As the Indians disturbed the grassy fringe with the movement of their paddles, the pollen fell from the antlers in showers," and would, doubtless, some of it, attain the female flowers disposed for its reception.

A parallel case to the above is that of the common Maize (*ZeaMays* L.), where the male flowers are borne in a long terminal raceme or panicle, and the female flowers are densely packed on spikes springing from the leaf-axils. Here the male flowers must plainly expand before the pollen contained in their anthers can be shed on the female organs below, whether of the same or of a different plant. That there are frequent cross-marriages in Maize is evidenced by the numerous varieties in cultivation in countries where it is a staple article of food, as in the Andes of Ecuador, where nine kinds, varying in the color of the grain (through white, yellow, and brown, to black), in its size, consistence, and flavor, are commonly cultivated; besides many others less generally known.

In *Pharus scaber* (H. B. K.) another tall broad-leaved grass, the spikelets stand by twos on the spike — a sessile female spikelet, and a stalked male spikelet.

In the fine forest grasses of the genus Olyra, whereof some species, such as *O. micrantha* (H. B. K.), rise to ten feet in height, and have lanceolate leaves above three inches broad, and a large terminal panicle, with capillary branches, like those of our *Aira cæspitosa*, it is the lower flowers that are male, with large innate (not versatile) anthers, and the upper that are female, with two large stigmas, that are either dichotomously divided, or clad with branched hairs, thus exposing a wider surface to the access of the pollen. And as the panicle is often pendulous, many of the male flowers, although placed lower down the axis, are actually suspended over the terminal female flowers.

It is generally to be remarked of declinous grasses, that either the male

flowers are very numerous, as in *Zea Mays*, or the stamens are multiplied in each male flower, as in Pariana, Leersia, Guadua, etc.; or the stigmatic apparatus of the female flowers is enlarged, so as almost to insure impregnation, as in Olyra and Tripsacum.

In the Bambuseæ I have gathered, belonging to the genera Guadua, Merostachys, and Chusquea, the flowers are more or less polygamous, and the stamens of the male flowers often doubled. But there is scarcely a genus in the whole order which is not described as having some flowers by abortion, neuter or male, and especially those that have biflorous spikelets, such as the Paniceæ. Some grasses, of normally hermaphrodite genera, are not unfrequently truly unisexual, such as certain species of Andropogon. I have occasionally seen panicles of *Orthocladus rariflorus* (Nees), a grass peculiar to the Amazon, quite destitute of stamens, and therefore purely female.

To come home to our own country: Is all the pollen wasted that a touch or a breath sets free from the flowers of grasses in such abundance? Watch a field of wheat in bloom, the heads swayed by the wind, lovingly kissing each other, and doubtless stealing and giving pollen. Consider, too, that throughout Nature, heat or moisture, or both, are essential to the emanation of the impregnating influence. In all our Festuceæ, as well as in Cynodon, Leersia, and some other genera, the stigmas are protruded from the side or from the base of the flower at an early stage, often before the stamens of the same flower are mature — thus as it were inviting cross fertilization from the more precocious stamens of other plants which are already shedding their pollen.

All who have gathered grasses will have remarked that some have yellow anthers, others pink or violet anthers; and that anthers of both types of color may co-exist on distinct individuals of the same species. The same peculiarity is just as noticeable in tropical grasses, and (without professing to give a complete physiological explanation of it) this is what I have observed respecting it. The walls of the anther-cells are usually of some shade of purple, but are so very thin and pellucid, that when distended with mature pollen the yellow color of the latter is alone visible. When the pollen is discharged, the anthers resume their original purple color, shortly, however, to take on the pallor or dinginess of decay. Where the anthers emerge of a purple hue, and change from that to brown, it will probably be found that they have discharged their pollen while still included in the flower. These observations, made without any reference to the question now in hand, require to be renewed and tested: and in them, as in all that precedes, I am open to correction.

Of grasses with bisexual flowers, there are two ways in which the ovary may be fertilized, namely, either by the pollen of its own flower (closed or open), or by that of other flowers, after the manner of the declinous species. In the latter case, the pollen may be transported by the wind, or in the fur of animals (as I have observed the seeds of Selagin-

ellas in South America), or in the plumage of birds. The agency of insects has not been traced in the fertilization of grasses, but may exist. The little flies I have seen on the flowers of grasses seemed bent on depositing their eggs in the nascent ovaries, but may also have aided in cross-fertilization. In the Amazon Valley grasses are often invested by ants, who, indeed, leave nothing organic unvisited throughout that vast region; and they also, I think, cannot help occasionally transferring grains of pollen from one flower to another.

The flowers of Palms and Grasses agree in being usually small and obscurely colored, but contrast greatly in the former being in many cases exquisitely and strongly scented, whereas in the latter they are usually quite scentless. The odor of Palm-flowers often resembles that of Mignonette; but I think a whole acre of that "darling" weed would not emit more perfume than a single plant of the Fan Palm of the Rio Negro (*Mauritia Carará* Wallace). In approaching one of these plants through the thick forest, the sense of hearing would perhaps give the first notice of its proximity, from the merry hum of winged insects which its scented flowers had drawn together, to feast on the honey, and to transport the pollen of the male to the female plants; for it is chiefly diœcious species of Palms that have such sweet flowers. The absence of odoriferous flowers from the grasses seems to show that insect-aid is not needed for effecting their fecundation, but does not render its accidental concurrence a whit less unlikely.

That grasses, notwithstanding their almost mathematical characters, vary much as other plants do, is plain from the multitude of osculating forms (in such genera as Eragrostis, Panicum, and Paspalum), which puzzle the botanist to decide when to combine and when to separate, in order to obtain what are called "good species." Hence the conclusion is unavoidable that in grasses, as in other plants, variations of surrounding conditions induce corresponding modifications of structure, and that amongst the former must be enumerated cross marriages, however brought about. If the flowers of grasses be sometimes fertilized in the bud, it is probably exceptional, like the similar cases recorded of Orchids and many other families.

To conclude: the more I ponder over existing evidence, the more I feel convinced that in its perfect state every being has the sexes practically separated, and that natural selection is ever tending to make this separation more complete and permanent; so that the hypothesis of Plato, that the prototype even of man was hermaphrodite, may one day be proved to be a fact! — Dr. R. Spruce, *Scientific Opinion*. [See his paper in Journ. Linn. Society.]

Fungi on Insects. — Dr. Bail of Danzig, in a recent pamphlet, calls attention to the various kinds of fungus that are parasitic upon the larvæ of different insects, and his investigations are of some practical importance in relation to a possible check to the destruction of forest-trees, which goes on to an enormous extent in North Germany, through the

ravages of caterpillars. In certain seasons these caterpillars appeared to be attacked by an epidemic, their bodies being swollen to bursting, and white threads being visible between the rings of the body, which seemed to issue from the body itself. In this condition great numbers were found still clinging to the leaves. The destroying agent had been identified by Dr. Reichhardt of Vienna as the mycelium of a fungus which he named *Empusa aulicæ*. The distribution of the *Empusa* is very considerable; the only order of insects which is not at present known to be subject to their attacks being the *Neuroptera* (dragon flies, etc.); they are known to be parasitic upon *Coleoptera* (beetles), *Hymenoptera* (bees, ants, etc.), *Lepidoptera* (butterflies and moths), *Diptera* (flies and gnats), *Orthoptera* (crickets, etc.), and aphides, either in the larva or perfect condition, on water-insects, and even the same species on amphibia and fishes. Not only is their distribution over so many different animals remarkable, but also the prodigious rapidity of their development in the individual. The common house-fly is, in some years, destroyed by this parasite in vast numbers, and the dung-fly has been in certain districts almost annihilated. In the forests of Pomerania and Posen the caterpillars have been killed by it in such quantities that it may be considered to have saved the trees from total destruction. The fungi which Dr. Bail found to be the most destructive to insect life were those described by authors as *Cordyceps militaris*, *Isaria farinosa*, and *Penicillium glaucum*; the two latter forms he inclines to unite as different stages of growth of the same plant. — *The Academy.*

Insect-fertilization of Flowers. — In an article contributed to "Scientific Opinion" by Professor Delpino, he passes from orchids, which since Darwin's work upon them have attracted much attention in this respect, to the related families, one of which is familiarly represented in our gardens by the *Canna*, or Indian Shot. Here the arrangements depends upon the viscidity of the pollen, and the bursting loose of the style; the pollen is first deposited on an expansion of the style, whence it is taken away by the insect, to be deposited upon the stigma of the flower next visited.

Collected Notes on American Oaks. — *Concluded.* A. De Candolle, in "Prodromus" XVI, 2, 1864, describes two hundred and eighty-one species. Of these one hundred and twenty-two are American; of which twenty-nine are doubtful. He admits *Q. olivæformis* Michx., *bicolor* Willd., *grisea* Lbm., *pungens* Lbm., *hastata* Lbm., *Leana* Nutt., as species. Thirteen species from Endlicher's list are made varieties of others; sixteen are synonyms of others. De Candolle proposes three new species: *Q. Lindeni* (collected in New Grenada in 1842, by Linden), *Wislizeni* (1846, in New Mexico by Wislizenus), and *omissa* (from Seemann's collection, but omitted in "Plantæ Hartwegianæ"). *Q. dumosa* Nutt., and *acutidens* Torr., are not mentioned. Counting these omitted species, and dropping *olivæformis* and *Leana* as such; then uniting *grisea* with *oblongifolia*

and *pungens*, and placing *hastata* in *Emoryi*, we have ninety American species. But even this number may be in the future greatly reduced, particularly in the Mexican species, which are founded on a limited number of specimens, and with the habitat for the most part not stated.

Michaux attempted the first methodical disposition of the genus, as above mentioned, which was after him maintained by Pursh, Nuttall and Elliott. In Europe the important character taken from the ripening of the fruit was entirely neglected. Only Koch, in "Flora Germanica," 1837, gives notice that *Q. Cerris* ripened its fruit in the second year.

Then Spach, in Vol. XI. of his "Histoire Naturelle des Veg. Phanerog." 1842, applied this character to his natural arrangement of the oaks, which is founded on the form and duration of the leaves, the cup and the ripening. His disposition is this:

I. Deciduous leaves: Esculus.
   1. Robur: Leaves sinuose, pinnatifid; lobes not bristle-pointed. Maturation annual; scales of the cup small, oval, appressed.
   2. Cerroides: Leaves pinnatifid, lobes not bristle-pointed. Maturation annual. Scales of the cup, the lower imbricated and appressed; the upper ones subulate, loose and much longer.
   3. Erythrobalanus: Leaves entire, mucronate or trilobed, or pinnate-lobed, bristle-pointed. Maturation biennial. Scales of the cup small, appressed, imbricated, not subulate.
   4. Cerris: Leaves late deciduous or subpersistent, coriaceous; lobes or teeth bristle-pointed. Female flowers often from buds without leaves, and so the fruit lateral on the year's shoot. Maturation annual. Scales of the cup echinate.
   5. Gallifera: Leaves late deciduous, becoming yellowish and brownish; lobes or teeth bristle-pointed. Maturation biennial. Scales of the cup short, appressed.

II. Leaves persistent: Ilex.
   6. Suber: Maturation annual.
   7. Coccifera: Maturation biennial.

Endlicher maintained the same disposition and characters, only changing *Cerroides* into Elæobalanus, and while Spach considers only the European, Western-Asiatic, and American species, he introduces the Eastern Asiatic, which he puts into the subgenus Cyclobalanus except one, *Quercus cuspidata*, which forms his subgenus Chlamydobalanus; the former are all in his subgenus Lepidobalanus.

Gay, in "Ann. des Sc. Nat., IV, 6," pointed out the errors in the above disposition. The character of maturation is mistaken in three groups: *Cerris*, *Gallifera* and *Suber*. *Q. Cerris* ripens its fruit the second year; so also *Q. ægilops* L., *castaneæfolia* C. A. Mey, and *persica* Jaub, & Spach. So the whole group Cerris has the maturation biennial. *Pseudosuber* Desf., and *hispanica* Lam., which Endlicher put as one species under Gal-

lifera, belong to Cerris. Spach forms, for the single species, *Q. infectoria* Oliv. To the group *gallifera*, with biennial maturation, Endlicher added *Q. humilis* Lam., *alpestris* Bois., and *hispanica* Lam., but the two former, as well as *infectoria*, ripen the fruit the first year. These groups contain only European species; the American botanist is more interested in Spach's group, *Suber*, with the species *Q. virens* Ait. This species was taken by all the authors from Michaux, the elder, to A. Gray, as maturing the fruit in the second year. Spach puts it with Suber, with annual maturation. In the "Prodromus," and in the latest edition of "Gray's Manual," it is annual. Gay agrees with, but does injustice to, Endlicher, when he says that Endlicher's seventy-seven American and thirty-five east Asiatic species, which never have been examined upon their maturation, had been joined with Suber. Endlicher ranges neither *virens* nor the rest in the group Suber, but into no group at all. His arrangement is thus: Ilex — 1. Mediterraneæ et orientales; VI. Suber. VII. Coccifera. 2. Americanæ. 3. Japonicæ, etc.

The disagreement of view in respect to maturation is explained by the fact that until now two different species, with different maturation, have been taken for one. Gay describes a species which grows in France and Spain along the Atlantic, and furnishes all the cork used in these countries. It is *Quercus occidentalis* Gay, with biennial maturation, and was kept before the discovery of Gay for Suber. It is remarkable that often quite similar species differ only in maturation, and it is not impossible that the mistake concerning *Q. virens* grounds on an interchange of *Q. cinerea* and the former. In regard to the first groups Gay follows Endlicher and Spach; but I think there is an objection to the second group Elæobalanus. The subulate prolongation of the upper scales of the cup is so variable that this character is not profitable to be used in a natural arrangement. I have seen fruits of *Q. macrocarpa*, in which the prolongation of the scales was scarcely perceptible; on the other hand I have seen fruits of *Q. bicolor* or *Prinus discolor*, with very much prolonged scales. It is my opinion that *Q. macrocarpa* falls under the group Robur, and that the group Elæobalanus should be dropped.

There are two essays of A. De Candolle in "Ann. des Sc. Nat. ser., IV, Vol. XVIII." (1862): *Sur le fruit du chêne* and *Etude sur l'éspèce*. De Candolle considers the proposed characters as incompetent to form natural groups in the section Lepidobalanus; for species closely related by one character are often disjoined by the other, but they are good enough to form artificial subdivisions, which are necessary from the great number of species. A new diagnostic character, discovered by De Candolle, is for the same reason unfit to form natural groups. This is the position of the abortive ovules at the base, or at the apex, of the ripe seed. Working out the genus *Quercus* for the "Prodromus" De Candolle mustered the different characters, to find out the best for determining the species. He considers as good ones, the size, form and pubescence of the stipules; the nervation of the leaf, respecting the direction and relative size of the

nerves of different degrees; their number to a certain point (?), the pubescence of the leaves and twigs (isolate or aggregate, on nerves or parenchyma); its length in younger parts; the duration of the leaves; the anthers (smooth or pubescent); the form of the cups in the upper part in the ripe fruit; the size of the cups, the general form and size of their scales; the maturation and the position of the abortive ovules.

Such characters as the following which, comprising many specimens, more or less differ on the same twig, are only good to determine varieties, viz.: the length of the petioles, the form of the leaf in regard to its diameter, to the base (acute, obtuse, or cordate); the depth of the incisures; the pointed or obtuse termination of the leaf; the presence and form of the bracts of the aments; the number of lobes of the perigone in the male flowers; the number of stamens; presence or absence of a mucro at the apex of the anthers; the length of the peduncle of the female flower; the swelling of the scales of the cup; the relative length of the acorn; the caducous or persistent pubescence of the underside of the leaves; the length and direction of bristles; the male flowers, whether pedicelled or sessile; the form of the cup at the base; the termination of the lower scales of the cup; the direction of the scales in the ripe fruit.

De Candolle adopts the three subgenera of Endlicher, adding two more from species which Endlicher puts under Lepidobalanus. The subgenus Androgyne, is formed by the single (Californian) species, *Quercus densiflora* Hook, which has the flowers of both sexes in an upright spike, male above, female below, the male flowers in bundles with three bracts, stamens double the number of the lobes of the perigone, the abortive ovules at the apex of the seed. The other new subgenus is Pasana, with South Asiatic species. All the other American species belong to the subgenus Lepidobalanus. The arrangement in the "Prodromus" is thus:

I. LEPIDOBALANUS.

§ 1. Abortive ovules below. Maturation annual.

* Leaves deciduous.

Q. LYRATA Walt., Q. MACROCARPA Michx. (with var. abbreviata and minor); Q. OLIVÆFORMIS Michx., *Q.* BICOLOR Willd. (*Q. Prinus tomentosa* Michx., *Prinus discolor* Michx. f., *Michauxii* Nutt.). There is a variety cultivated in France, *β. platanoides*=*Q. prinus platanoides* Lam.=*Q. velutina* herb l'Her.=*Q. pannosa* Bosc. (which is, perhaps, *Q. mollis* Nutt.=*Q. filiformis* Muhl.). Q. PRINUS L.=*Q. prinus palustris* Michx. (De Candolle refers to this the figure *Q. montana* in Emerson's Trees of Mass., Pl. 6, and the text to the next). *Q. Prinus β acuminata*=*Q. castanea* Muhl. (Emerson says the younger Michaux makes this a distinct species. This is not so as far as I know). *Q. Prinus γ monticola*=*Q. Prinus foliis obovatis* Wangenh.=*Q. montana* Willd., *Q. Prinus δ chincapin*=*Q. prinoides* Willd. =*Q. Prinus pumila* Mich.=*Q. chincapin* Pl.=*Q. Prinus chincapin* Michx. fil. *Q.* STELLATA Wg.=*Q. obtusiloba* Michx.=*Q. villosa* Walt.? There are three varieties *β Floridana*=*Q. Floridana* Shutlew, *γ depressa* (Nutt.) on

the upper Missouri, δ *Utahensis* the only oak between Salt Lake and Sierra Nevada, Q. ALBA L. with two varieties (?) β *repranda*, γ *microcarpa*.

Q. UNDULATA Torr.=*Fendleri* Lbm. Two varieties β *obtusifolia*, γ *pedunculata*. Q. DOUGLASII Hook, with three varieties, β *Gambellii*=*Q. Gambellii* Nutt., γ *novo-Mexicana*=*Q. Gambellii* Lbm. δ *Neaei*, *Q. Neaei* Lbm.=*Q. Douglasii* Bth. Q. LOBATA Née=*Q. Hindsii* Benth.=*Q. longiglanda* Torr. Q. GARRYANA Hook. Q. DRUMMONDII Lbm. These five species are very likely varieties of one species nearly related to the European Q. Robur.

The following are Mexican and Central American species, with dentate or entire leaves; the maturation of the fruit is not sufficiently known.

Q. CORRUGATA Hook, Q. INSIGNIS Mart. Gal., Q. STROMPOCARPA Lbm., Q. GALEOTTII Mart., Q. CIRCINATA Née, Q. MAGNOLIÆFOLIA Née, with two varieties, β *lutea*=*Q. flava* Née, γ *macrophylla*=*Q. macrophylla* Née=*Q. resinosa* Lbm., Q. OBTUSATA HB.=*Q. affinis* Mart. Gal.; the varieties β *pandurata*=*Q. pandurata* HB. γ *Hartwegii*=*Q. ambigua* HB.=*Q. Hartwegi* Benth.=*Q. nudinervis* Lbm., Q. POLYMORPHA Cham et Schl.=*Q. petiolaris* Benth.=*Q. varians* Mart. Gall.=*tuberculata* Lbm., Q. OMISSA A. DC., Q. LAXA Lbm.=*Q. callosa* Mart., Q. LAETA Lbm.=*Q. obtusata* var. Bth., Q. BENTHAMI A. DC.=*undulata* Bth., Q. TAPUXAHUENSIS A. DC.=*Q. salicifolia* Bth., Q. CORTESII Lbm., Q. SARTORII Lbm., Q. SALICIFOLIA Née, Q. SEEMANNI Lbm., Q. GHIESBREGHTI Mart. Gal., Q. BARBINERVIS Benth., Q. GLAUCOIDES Mart., Gal.=*Q. elliptica* Lbm.

* * Leaves persistent.

Q. HUMBOLDTII Bonpl., Q. CITRIFOLIA Lbm., Q. COSTARICENSIS Lbm., Q. LINDENI A. DC., Q. TOLIMENSIS HB., Q. TOMENTOSA Willd.=*Q. pedunculata* Née=*Q. callosa* Bth. There are four varieties:—α. *communis*=*Q. tomentosa* Bth., β *bullata*, γ *diversifolia*=*Q. diversifolia* Nèe, δ. *abbreviata*, Q. RETICULATA HB.=*Q. spicata* HB=*decipiens* Mart. Gal., the variety β *Greggii*, Q. PULCHELLA HB., Q. GLABRESCENS Bth. with the var. β. *integrifolia*, Q. GRISEA Lbm. (probably *Q. oblongifolia* Torr.) Q. REPANDA HB., Q. MICROPHYLLA Née=*Q. repanda* Bth. with the var. β *crispata*, Q. OBLONGIFOLIA Torr., Q. PUNGENS Lbm., and HASTATA Lbm. (both being *Q. Emoryi* Torr.) Q. BERBERIDIFOLIA Lbm., Q. AGRIFOLIA Née=*Q. oxyadenia* Torr. I examined a number of acorns of this species and found in all of them the abortive ovules at the apex of the seed!, Q. CHRYSOLEPIS Lbm.=*Q. crassipocula* Torr.=*Q. fulvescens* Kell., Q. VIRENS Ait.=*Q. sempervirens* Cat.=*Q. Phellos* β. L.=*Q. Virginiana* Mill.=*Q. oleoides* Cham. and Schl.=*Q. retusa* Lbm., Q. LUTESCENS Mart. Gal.

§ 2. Abortive ovules below. Maturation biennial.

Leaves persistent.

Q. CRASSIFOLIA HB.=*Q. rugosa* Née=*Q. spinulosa* Mart. Gal., Q. SPLENDENS Née, with the var. β. *pallidior*=*Q. crassifolia* Bth., Q. SCYTOPHYLLA Lbm., Q. SIDEROXYLA HB., Q. LAURINA HB.

§ 3. Abortive ovules above. Maturation biennial.

* Leaves deciduous.

Q. FALCATA Michx.=*Q. elongata* Willd.=*Q. discolor* Ait.; there are two varieties, β *Ludoviciana*, γ *triloba*=*Q. triloba* Michx.=*Q. cuneata* Wg., Q. ILICIFOLIA Wg.=*Q. Banisteri* Michx., Q. CATESBÆI Michx., *Q. rubra* L. with the var. β *runcinata*, Q. PALUSTRIS Du Roi=*Q. rubra ramosissima* Marsh.=*Q. rubra dissecta* Lam., Q. GEORGIANA A. Curt., Q. COCCINEA *Q. coccinea* Wg.=*Q. rubra* α L. There are four varieties: α *coccinea*=*Q. coccinea* Michx.=*Q. ambigua* and *borealis* Michx. fils.; β *nigrescens*=*Q. tinctoria sinuosa* Michx.=*Q. discolor* Willd.=*Q. tinctoria* Michx. fils.; γ *tinctoria*=*Q. tinctoria* Batr.=*Q. tinctoria angulosa* Michx.=*Q. velutina* Lam., δ *Rugelli*, Q. SONOMENSIS Bth.=*Q. rubra* Bth. in Pl. Hartw., Q. LEANA Nutt. De Candolle considers the hybridity of this as not certain. It is perhaps not so scarce as supposed; there is besides the known individuals one in Fulton County, Illinois, and one near Peoria, the latter in the immediate neighborhood of *Q. coccinea* and *imbricaria*. Q. TOTUTLENSIS A. DC., Q. PHELLOS L. with the var. β *subimbricaria* (hybrid?), Q. IMBRICARIA Michx. with a var. β *spinulosa*, Q. NIGRA L.=*ferruginea* Michx. fils.=*Q. Marilandica* Cat.; there are two varieties, β *quinqueloba*, γ *tridentata*, Q. SKINNERI Bth., Q. XALAPENSIS HB., Q. WARSCEWICZII Lbm.=*Q. glabrescens* Seem.=*Q. oöcarpa* Lbm., Q. CALOPHYLLA Cham. and Schl.=*C. Alamo* Bth.=*Q. intermedia* Mart. Gal.=*Q. acuminata* Mart. Gal.

* * Leaves persistent

Q. GRANDIS Lbm., Q. ACUTIFOLIA, Née=*Q. furfuracea*, there are five vars.: β Bonplandi, γ *angustifolia*=*Q. acutifolia* Thib., δ *conspersa* Bth.=*nitida* Mart. Gal. ε. *longifolia*=*longifolia* Lbm. ζ *microcarpa*, Q. WISLIZENI A. DC., Q. AQUATICA Walt., Willd.=*Q. nigra* L. α=*Q. uliginosa* Wg.=*Q. Phellos maritima* Michx.=*Q. maritima* Willd., of this five varieties are enumerated; β *laurifolia*=*Q. laurifolia* Mich.=*Q. hemisphærica* Bartr. γ *heterophylla*=*Q. heterophylla* Michx. fils. (hybrid?), δ *stipitata*, ε. *dentata*=*Q. dentata* Bartr.=*Q. nana* Willd? ζ *myrtifolia*=*Q. myrtifolia* Willd. Q. NITENS Mart. Gal.=*Q. commutata* Lbm., four vars.; β *podocarpa* γ *ocoteæfolia*=*Q. ocoteæfolia* Lbm., δ *major*, ε *subintegra*=*Q. laurifolia* Bth., Q. LANCEOLATA HB. with the var. β *undulato-dentata*=*Q. laurina* Lbm., Q. DEPRESSA HB., Q. GRANULATA Lbm., Q. LINGUÆFOLIA Lbm., Q. ELLIPTICA Née with var. β *microcarpa*=*Q. perseæfolia* Lbm.=*Q. microcarpa* Lbm., Q. NECTANDRÆFOLIA Lbm., Q. LEIOPHYLLA A. DC.=*Q. lancifolia* Lbm., Q. CASTANEA Née=*Q. mucronata* Willd.=*Q. tristis* Lbm. the four vars.: β *sublobata*, γ *tridens*=*Q. tridens* HB., δ *glabrata*=*Q. Mexicana* var *glabrata* Seem., ε *Mexicana*=*Mexicana* HB., Q. LANIGERA Mart. Gal., Q. CRASSIPES HB.=*Q. Mexicana* Bth., Q. CINEREA Michx.=*Q. Prinus* β L=*Q. Phellos cinerea* Spach, with four vars.: β *dentato-lobata*, γ *humilis*=*Q. humilis* Walt., δ *pumila*=*Q. pumila* Walt.=*Q. sericea* Willd.=*Q. Phellos pumila* Michx., ε *nana*, Q. RUGULOSA Mart. Gal., *Q.* CONFERTIFOLIA HB.

Then follow twenty-nine doubtful species.

II. ANDROGYNE.

Q. DENSIFLORA Hook. and Arn.=Q. *echinacea* Torr., the var. β *Hartwegi* is *Q. densiflora* Bth. in Pl. Hartw.

De Candolle supposes that of the species now known and described about two-thirds are provisional, and that when all the species of America and Asia now adopted are as well studied as the European, the "good species" will be reduced to about one hundred; then the American species would scarcely be more than fifty. This is credible when we perceive that the single species *Q. Robur* as proposed by De Candolle includes thirty-two varieties, and nearly a hundred synonyms. He went to work without prejudice or prepossession; he examined specimens by hundreds from different localities; and the result was that he had to drop many supposed "good species." What will become of our American, particularly the Mexican species, when once worked out in that way?

I thought I had a very good character, neglected by all authors, in the bud. The *Quercus coccinea*, wherever I found it here (Peoria) had a conical pointed tomentose five-ridged bud, with five rows of scales, and I was sure I should never see it otherwise. Now I get from northern Illinois a number of specimens with the acorns and all the other characters decidedly those of *Q. coccinea*, but some of them with smooth round buds, just as in *Quercus rubra*. We have now about half a dozen species united in *Q. coccinea;* the difference between *Q. rubra* and *Q. palustris* is so insignificant that the latter could be taken as a variety of the former, and perhaps, when we compare all the black and red oaks by many hundreds of specimens from all the different sections of the country, the limits between the species as now accepted would be very uncertain. Even *Quercus bicolor* seems to me to be a transitional form between *Q. macrocarpa* and *Q. Prinus;* to the former it is approximate by the often subulate scales, the pubescence of the lower side of the leaves, the buds, and the scaly bark of the twigs, which are often corky in *Q. macrocarpa*. An exact definition of the term "species" has never been proposed. Since Darwin's theory has made the stability of species questionable, it has lost much of its importance; but we want a certain term, be it species, or form, or race, or whatever it be: we want a name for an object, that it may be understood. That is the task of species. I cannot see more in it. — FRED. BRENDEL, *Peoria, Ill.*

DOES AIR DUST CONTAIN THE GERMS OF DISEASE? — Dr. Tyndall, in a recent lecture, asserted: (1), that the dust in the air we breathe is largely composed of organic particles; (2), that they are the germs of plants like the yeast and such-like fungi; and (3), that they are the means by which epidemic diseases are propagated.

The editor of "Scientific Opinion," claims that "each and all of these propositions appear to us incapable of being proved." He claims that a temperature of 212° or higher, such as Tyndall says will in a moment of time destroy them, will have no effect on them; secondly that "observations such as those of Pouchet, Joly, Musset, Mantegazza and others, all go to show that the germs of many of the lower vegetable organisms which are familiar to botanists, are not present in the air generally. Thirdly, the hypothesis that the contagious substance of small pox, scarlet

fever, cholera, and the like diseases" is a vegetable organism, rather than a minuté particle of disorganized organic matter, is but an hypothesis and nothing more. So far as it has been attempted to be demonstrated by the experiments of Hallier and others, it has utterly broken down, and the ablest fungologists in the kingdom — Berkley and others — are distinctly opposed to it, as are, we believe, the more scientific of our modern physicians.

ZOOLOGY.

HABITS OF THE STRIPED SQUIRREL. — I lately noticed in my garden a bright-eyed chipmunk, *Sciurus striatus*, advancing along a line directly towards me. He came briskly forward, without deviating a hair's breadth to the right or the left, till within two feet of me; then turned square towards my left — his right — and went about three feet or less. Here he paused a moment and gave a sharp look all around him, as if to detect any lurking spy on his movements. (His distended cheeks revealed his business: he had been out foraging.) He now put his nose to the ground, and, aiding this member with both forepaws, thrust his head and shoulders down through the dry leaves and soft muck, half burying himself in an instant.

At first, I thought him after the bulb of an *erythronium*, that grew directly in front of his face and about three inches from it. I was the more confirmed in this supposition, by the shaking of the plant.

Presently, however, he became comparatively quiet. In this state he remained, possibly, half a minute. He then commenced a vigorous action, as if digging deeper; but I noticed that he did not get deeper; on the contrary, he was gradually backing out. I was surprised that, in all his apparent hard work (he worked like a man on a wager) he threw back no dirt. But this vigorous labor could not last long. He was very soon completely above ground; and then became manifest the object of his earnest work: he was refillling the hole he had made, and repacking the dirt and leaves he had disturbed. Nor was he content with simply refilling and repacking the hole. With his two little hand-like feet he patted the surface, and so exactly *replaced the leaves* that, when he had completed his task, my eye could detect not the slightest difference between the surface he had so cunningly manipulated, and that surrounding it. Having completed his task, he raised himself into a sitting posture, looked with a very satisfied air, and then silently dodged off into a bush-heap, some ten feet distant. Here, he ventured to stop, and set up a triumphant "chip! chip! chip!"

It was now my turn to dig, in order to discover the little miser's treasures. I gently removed enough of the leaves and fine muck to expose his hoard — half a pint of buttercup seeds, *Ranunculus acris*. I took out a dozen seeds or so, re-covered the treasure as well as my bungling hands could, and withdrew filled with astonishment at the exhibi-